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THE FUTURE OF AGRICULTURAL BIOTECHNOLOGY: PROSPECTS FOR BRAZIL

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Abstract

Despite recent breakthroughs in plant biotechnology research and development in Brazil, genetically modified plants have not yet been commercialized. We examine here the current global trends in this area and the existing legal impasse in the country, discussing how they may affect Brazilian agriculture and trying to anticipate possible scenarios for the next future.

Introduction

Important advances in agricultural biotechnology research and development have taken place in the last decade in Brazil. Agricultural research and development programs in the country are benefiting from the application of diverse biotechnology tools: marker-assisted plant and animal breeding, genomic mapping of several species, embryo transfer applied to different animal species, genetic resources characterization and conservation, and transgenic products (Sampaio, 2000).

Genome research in agriculture has been conducted by outstanding national research institutes, with international scientific recognition. Diverse projects have been developed: the Sugar Cane EST Project, part of the ONSA – Organization for Nucleotide Sequencing and Analysis Net, co-financed by the São Paulo State Research Foundation –FAPESP, aiming to identify around 50.000 sugar cane genes; the development of Brazilian corn to produce growth hormone, developed by the Molecular Biology and Genetic Engineering Center of the State University of Campinas (UNICAMP) and the Chemistry Institute of the University of São Paulo (USP); the development of Papaya resistant to Brazilian Strain of Ring Spot Virus, development by EMBRAPA in collaboration with Cornell University; development of Common Beans Resistant to Golden Mosaic Virus, developed by EMBRAPA –Rice and Beans Center. Several new other projects in crucial areas for biotechnology in Brazilian agriculture are starting now. Significant additional extra-budgetary resources for biotechnology provided by the new Sectoral Funds recently

created by the Brazilian Ministry of Science and Technology will certainly impact on this priority research area.

Another good example of excellence in this area is the sequencing by a research group supported by FAPESP (Brazil's São Paulo State Research Foundation), in collaboration with the US Agricultural Research Service (ARS) of the bacterium *Xylella fastidiosa*, strains of which cause Pierce's disease, a major U.S. grape problem and a citrus disease that costs Brazilian citrus growers millions of dollars annually. For the first time in the world a phytopathogenic bacterium was sequenced (Simpson et al. 2000).

These new breakthroughs resulting from plant biotechnology are stimulating national and international research groups to develop new plants with better stress resistance, cultivated with lower inputs of toxic chemicals, that can be turned into bio-factories, that can be better harvested and transform sunlight and that will be more resistant to UV radiation (an effect of the diminishing ozone layer)(Sampaio, 2000). Plant biotechnology can also be designed to reduce allergenic components in conventional food, such as wheat and peanut (Avery, 2000).

However, despite these extraordinary advances in biotechnology, genetically modified plants have not yet been commercialized in the country. This situation can result in detrimental impacts on the Brazilian agriculture, since it may reduce the country's competitive capacity on international markets and limit access to new markets.

In 1998, CTNbio, the Brazilian National Biosafety Commission approved, after detailed and careful analysis, Monsanto's Round Up Ready soybean for commercialization and required from the enterprise a five-year post-commercialization monitoring plan. However, this approval by CTNBio has been subject in the last four years to diverse legal battles by international and national environmental organizations and consumer NGOs, paving the way for a moratorium for transgenic crops in the country. Their arguments are based on possible potential impacts of transgenic soybean on human health and the environment, particularly on Brazil's biodiversity.

These opposing arguments, which often lack scientific evidence, tend to minimize the quality of CTNBio's careful evaluations. They often find some political ground on the lack of adequate information by the public on the existing biosafety procedures in the country for risk anticipation, risk evaluation and risk management, which are necessary for both conventional and biotechnology food production.

Sharing knowledge and information with the public about food safety and thus increasing public acceptance is therefore a crucial issue, particularly for developing countries like Brazil.

Recently, several enterprises involved with genetically modified food production (Monsanto, DuPont, Cargill, Aventis, Basf, Dow Agroscience and Syngenta) decided to join their efforts in order to improve the quality of scientific information on the subject and created in Brazil an NGO, the CIB (Council for Biotechnology Information), similar to the CIB created previously in the US in year 2000, in order to improve knowledge and to

provide access to adequate information to the diverse segments of Brazilian society (government officers, Congress, academic community, lawyers, judges, etc.).

Brazil is the second market in the world for production and export of transgenic-free soybean, exported basically to the European market. The European consumers are now the main beneficiaries of the legal obstacles to GMO commercialization in Brazil, since they pay lower prices for the Brazilian transgenic-free soybean than they would pay for certified transgenic-free soybean from other countries, such as the U.S. or Argentina.

Nevertheless, ABRASEM (the Brazilian Association for Seed Producers, representing producers in several Brazilian states), has in several opportunities expressed its concern with recent estimates that now more than two-thirds of the cultivated soybean area in the State of Rio Grande do Sul, the third greater Brazilian soybean producer, might be illegally cultivated with genetically modified seeds, mostly imported from Argentina, which is with the U.S., Canada and China, one of the four greatest producers of transgenic crops in the world. The Association is pressuring for regulation of certified transgenic seeds in the country, stressing that this regulatory delay contrasts with the country's increasing investments in agricultural biotechnology in research institutes and universities. According to ABRASEM, this delay may reduce Brazil's productivity and competitiveness.

There are indications that the farmers in Rio Grande do Sul were attracted by the economic advantages and lower costs of production provided by GMO crops, which allow more effective control of insect pests and weeds and reduced number of conventional herbicide and insecticide applications. Farmers in other Brazilian States have also been reported planting illegal transgenic seeds, now subject to inspections by State and Federal agriculture fiscal agents.

The Brazilian biosafety regulatory system

In 1995 a Biosafety Law was created in Brazil and a National Technical Biosafety Commission (CTNBio) was implemented under a Presidential Decree, with the authority to develop regulations to deal with all scientific and technical aspects of biosafety of genetically modified organisms, related to human and animal health, agriculture and the environment. CTNBio was given the authority to regulate experiments at both laboratory and field levels and to provide a final conclusive technical opinion on the environmental and food safety of GM plants and food derived from GM crops, previously to the commercial clearance authorization by the Ministries of Health, Agriculture and Environment,.

As mentioned before, in 1998 CTNBio delivered its first positive final conclusive technical opinion on environmental and food safety for commercialization of a transgenic soybean tolerant to the herbicide glyphosate submitted by Monsanto. Since CTNBio did not identify this transgenic soybean as "potentially harmful for the environment", it did not request from the Ministry of Environment a study for its environmental impact (EIA – Environmental Impact Study). The Ministry of Environment may request this

environmental impact study before making a judgement for approval and authorization of the product.

This situation, favored by a former unclear legal framework, where it was not so explicit CTNBio's authority to identify when a GMO can be potentially harmful to human health and the environment, resulted in several lawsuits and injunctions by non-governmental organizations opposed to plant biotechnology. This legal impasse led to a Constitutional debate and blocked the commercialization of transgenic crops in the country, which is still not resolved.

In December 2000 the legal framework drastically changed and created a positive legal scenario for CTNBio, despite the persistence of the adverse political situation. A Provisionary Law signed by the President of Brazil and four Cabinet Ministers modified the biosafety requirements and clearly established the authority of CTNBio to identify when a GMO can be potentially harmful to human health and the environment, defining it as a previous and necessary condition to the Ministry of Environment to request EIA – Environmental Impact Study and to the other Ministries' authorizations (Ministry of Health and Ministry of Agriculture).

To date, commercial approval of glyphosate tolerant soybean in Brazil is still pending, despite this new positive legal framework. The next phase of the legal dispute is expected to the last week of February, when Congress will examine a legal project by federal deputy Confucio Moura and Justice will give the veredict on Monsanto's soybean. Several issues will then be considered, including labelling of GM products. Despite a Presidential decree establishing label for products containing more than 4 per cent of GMOs, Congress is now discussing, within deputy Confucio Moura's project, who incorporated the same labelling criteria, the possibility of a more strict legislation on the subject. The feasibility of eventual new labelling procedures will carefully considered by the Brazilian government, since additional costs should not be transferred to the consumer.

The future – final commentaries

The expansion and commercialization of transgenic crops worldwide seems an irreversible process. The global transgenic crop area expanded by more than 25-fold, from 1.7 million hectares in 1996 to 44.2 million hectares in 2000 (now 16% of total crop area, with transgenic soybean planted in 36% of global soybean area), indicating the growing acceptance of the technology by farmers in both developed and developing countries. Four countries grew 99% of the global transgenic area: U.S., with 30.3 million hectares, followed by Argentina, with 10 million hectares, Canada with 3 million and China with 0.5 million (Clive James, 2001).

Brazil is the third global crop protection market (8%) for herbicides, insecticides, fungicides and plant growth regulators and others, estimated in US$ 2.5 billion(Wood Mackenzie Agrochemical Services, 2001 *in* James, C. 2001) and the sixth world commercial market for seed and planting material, estimated in US$ 1.2 billion (FIS 2001).

The growing introduction in this market of illegal transgenic seeds, as referred by ABRASEM, suggests acceptance of the technology and seems to indicate a new trend, despite the environmentalist dream of a sacred transgenic-free soil, which has kept biotechnology enterprises out of the largest agricultural Latin American market for almost four years.

Environmental concerns are certainly a crucial and sensitive issue if we take into account the biodiversity in Brazil, but the final government decisions will require the necessary scientific evidence and biosafety procedures requested by CTNBio.

In the international scene, biosafety concerns and environmental restrictions, despite their relevance for a safer world, should not be seen as market constraints to the export of GM products from developing countries like Brazil. Ethical and equity issues should also be considered in international relations.

Recognizing Intellectual Property Rights (IPR) is another crucial international issue challenging the development of genetically modified products in agriculture. As noted by Sampaio (2000), since TRIPS (Trade Related Intellectual Property Rights) agreements have obliged most developing countries to move to some level of recognition of IPRs in agriculture, it will require from our scientists and decision makers a behavioural change that will come as a consequence of understanding the system, in order to be able to deal with the difficulties and the costs of negotiating license agreements.

There seems also to be a consensus among economic analysts and agriculture policy and decision makers in the country that, despite the current legal impasse, legalization of transgenic crops in Brazil is just a matter of time. Even pessimistic prospects, which consider possible political obstacles (presidential elections, lack of consensus at different government levels and resistance by NGOs), tend to project legalization of GMO crops in Brazil to 2003.

In CTNBio, we understand that agriculture in Brazil and in the South American region should benefit from all the contributions that plant breeding technologies can provide (Belém et al. 2000, 2001), adopting a combined sustainable strategy with both conventional and biotechnology methods. In our view, safe improved crop varieties are crucial to mankind's future and to food security both in developed and developing countries.

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